

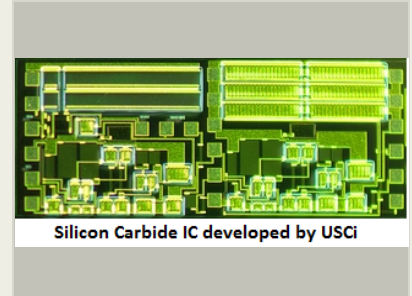
Extreme Environment Electronics based on Silicon Carbide, Phase I



Completed Technology Project (2015 - 2015)

Project Introduction

Radiation tolerant, extreme temperature capable electronics are needed for a variety of planned NASA missions. For example, in-situ exploration of Venus and long duration Europa-Jupiter missions will expose electronics to temperatures up to 500 Deg.C and radiation of 3 Mrad (Si) total dose. During this program, United Silicon Carbide will extend the capability of its SiC JFET integrated circuit fabrication technology to produce electronics compatible with such extreme environments. Silicon Carbide (SiC) junction field effect transistor (JFET) based electronics are ideal for these environments due to their excellent radiation tolerance and high performance and reliability over an extremely wide operating temperature range. SiC electronics can be used in applications ranging from low power, low noise mixed signal electronics for precision actuator control, sensor interfaces, and guidance and navigation electronics to power electronics for power management and distribution and power processing units. Systems built with SiC based electronics will have longer storage and operating lifetimes when compared to systems built with existing silicon electronics. Use of SiC integrated circuits will also lower system mass, volume, and power by reducing or eliminating the need for cooling and radiation shielding. In Phase I, we will perform measurements and modeling to show the feasibility of extending the capability of our SiC integrated circuit (IC) technology to meet NASA's extreme environment needs. In Phase II, we will fully develop the extreme environment capable SiC IC technology and demonstrate it through test and delivery of a high temperature, radiation hard, mixed signal sensor and control circuit. Following Phase II, we will provide access to the process technology and related design intellectual property through a commercial fabrication service so that NASA and others can fully leverage its capability.



Extreme Environment
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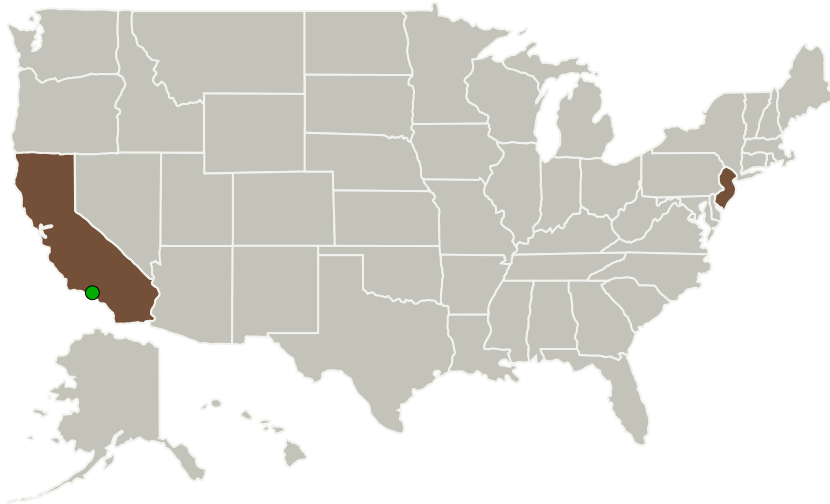
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Primary U.S. Work Locations and Key Partners




Organizations Performing Work	Role	Type	Location
United Silicon Carbide, Inc.	Lead Organization	Industry	Monmouth Junction, New Jersey
● Jet Propulsion Laboratory(JPL)	Supporting Organization	NASA Center	Pasadena, California

Primary U.S. Work Locations

California	New Jersey
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Project Transitions

 **June 2015:** Project Start

Organizational Responsibility

Responsible Mission Directorate:

Space Technology Mission Directorate (STMD)

Lead Organization:

United Silicon Carbide, Inc.

Responsible Program:

Small Business Innovation Research/Small Business Tech Transfer

Project Management

Program Director:

Jason L Kessler

Program Manager:

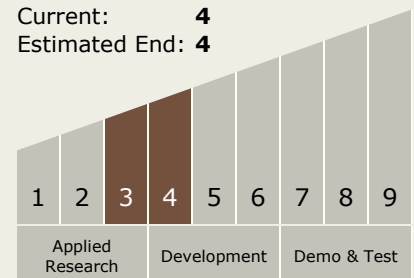
Carlos Torrez

Principal Investigator:

Matthew O'grady

Technology Maturity (TRL)

Start: 3
Current: 4
Estimated End: 4



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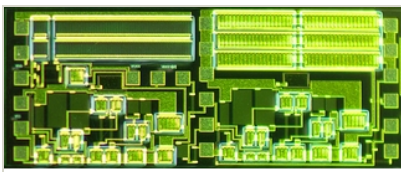
December 2015: Closed out

Closeout Summary: Extreme Environment Electronics based on Silicon Carbide, Phase I Project Image

Closeout Documentation:

- Final Summary Chart Image(<https://techport.nasa.gov/file/138853>)

Images



Silicon Carbide IC developed by USCi

Briefing Chart Image

Extreme Environment Electronics based on Silicon Carbide, Phase I (<https://techport.nasa.gov/image/132652>)

Technology Areas

Primary:

- TX08 Sensors and Instruments
 - └ TX08.1 Remote Sensing Instruments/Sensors
 - └ TX08.1.2 Electronics

Target Destinations

The Sun, Earth, The Moon, Mars, Others Inside the Solar System, Outside the Solar System